

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

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AUG 27 2001

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

In the Matter of )  
Petition of WorldCom, Inc. Pursuant )  
to Section 252(e)(5) of the )  
Communications Act for Expedited )  
Preemption of the Jurisdiction of the )  
Virginia State Corporation Commission )  
Regarding Interconnection Disputes )  
with Verizon Virginia Inc., and for )  
Expedited Arbitration )

CC Docket No. 00-218

In the Matter of )  
Petition of Cox Virginia Telecom, Inc., etc. )

CC Docket No. 00-249 /

In the Matter of )  
Petition of AT&T Communications of )  
Virginia Inc., etc. )

CC Docket No. 00-251

**VERIZON VIRGINIA INC.**

**VOLUME I OF II**

**REBUTTAL OF AT&T/WCOM MODIFIED  
SYNTHESIS MODEL**

**(PUBLIC)**

**AUGUST 27, 2001**

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August 27, 2001

**BY HAND DELIVERY**

Ms. Magalie R. Salas  
Secretary  
Federal Communications Commission  
445 Twelfth Street, S.W.  
Washington, D.C. 20554

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**AUG 27 2001**

**FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY**

**RE: WorldCom, Cox, and AT&T v. Verizon  
CC Docket Nos. 00-218, 00-249, and 00-251**

Dear Ms. Salas:

Enclosed for filing please find 4 public versions of Verizon Virginia Inc.'s ("Verizon VA") Rebuttal Testimony in the above-referenced arbitration proceedings. The rebuttal testimony consists of two volumes. Volume I contains information proprietary to Verizon VA; and Volume II contains information proprietary to AT&T. This proprietary information has been redacted from the publicly available copies.

Verizon VA is also serving 8 copies (and 3 electronic copies) of the non-public versions of the testimony, as well as 2 copies of the public versions, on Commission staff.

Please call Scott Randolph (202-515-2530) or me if you have any questions.

Very truly yours,



Catherine Kane Ronis  
Attorney for Verizon Virginia Inc.

Ms. Magalie R. Salas

Page 2 of 2

August 27, 2001

cc: Dorothy Attwood (8 proprietary copies; 2 public copies)  
Mark A. Keffer (1 public and 1 proprietary copy)  
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**Before the  
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Corporation Commission Regarding	)	
Interconnection Disputes with Verizon	)	
Virginia Inc. and for Arbitration	)	
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Virginia Inc., Pursuant to Section 252(e)(5)	)	CC Docket No. 00-251
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of the Jurisdiction of the Virginia	)	
Corporation Commission Regarding	)	
Interconnection Disputes With Verizon	)	
Virginia Inc.	)	

**VERIZON VIRGINIA INC.'S  
REBUTTAL TESTIMONY**

**CERTIFICATE OF SERVICE**

I do hereby certify that true and accurate copies of the foregoing, Verizon Virginia Inc.'s Rebuttal Testimony, Volumes I-II, were delivered this 27<sup>th</sup> day of August, 2001, by hand to:

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Virginia Inc., etc.	)	
	)	

**VERIZON VIRGINIA INC.**

**VOLUME I OF II**

**REBUTTAL TESTIMONY OF DR.TIMOTHY TARDIFF  
ON THE AT&T/WCOM MODIFIED SYNTHESIS MODEL**

**AUGUST 27, 2001**

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**I. INTRODUCTION  
(JDPL ISSUES II-1 TO II-1-C; II-2 TO II-2-C)**

**Q. Please state your name, occupation, and business address.**

A. My name is Timothy J. Tardiff. I am a Vice President at National Economic Research Associates ("NERA"). My business address is 1 Main Street, Cambridge, MA 02142.

**Q. Please describe your educational background and professional experience.**

A. I received a B.S. degree from the California Institute of Technology in Mathematics (with honors) in 1971 and a Ph.D. in Social Science from the University of California, Irvine in 1974. From 1974 to 1979, I was a member of the faculty at the University of California, Davis. I have specialized in telecommunications policy issues for the past 19 years. My research has included studies of the demand for telephone services, such as local measured service and toll, analysis of the market potential for new telecommunications products and services, assessment of the increasing competition for telecommunications services, and evaluation of regulatory frameworks consistent with increasing competitive trends. My academic credentials and professional experience are set forth in more detail in Attachment A.

**Q. Have you testified previously on telecommunications matters before state regulatory commissions?**

A. Yes. I have extensive experience as a consultant and expert witness in regulatory proceedings. I have filed several affidavits in proceedings before the Federal Communications Commission ("Commission") (often in collaboration with Professor Alfred Kahn) covering issues such as the proper economic principles for costing and pricing local exchange services and unbundled network elements ("UNEs"), the

**Rebuttal Testimony of Timothy J. Tardiff**

1 competitiveness of high-capacity transmission services in support of applications by US  
2 West for forbearance under Section 10 of the Telecommunications Act of 1996 (the  
3 "Act"), and public interest affidavits in support of SBC's applications for entry into the  
4 interLATA long-distance market.

5  
6 I have also testified in state regulatory proceedings and arbitrations pursuant to  
7 the Act on local network unbundling and universal service funding in Alabama, Alaska,  
8 Arkansas, California, the District of Columbia, Indiana, Kansas, Kentucky, Maryland,  
9 Massachusetts, Maine, Missouri, North Carolina, New Hampshire, New York,  
10 Oklahoma, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, and Virginia. I  
11 have filed testimony and reports before the California Public Utilities Commission on  
12 incremental cost principles, rules for local competition, universal service funding, open  
13 access and network architecture, price elasticity for toll and access services, regulation of  
14 wireless telecommunications services, treatment of accounting changes for post-  
15 retirement benefits under price caps, review of California's price cap plan, and flexible  
16 pricing for Centrex service. I have testified on intraLATA presubscription before the  
17 Illinois Commerce Commission, and filed a report with the New York Public Service  
18 Commission on intraLATA presubscription on behalf of New York Telephone.

19  
20 **Q. What is the purpose of your testimony?**

21 **A.** The purpose of my testimony is to respond to the Direct Testimony of Brian F. Pitkin on  
22 behalf of AT&T Communications of Virginia, Inc. ("AT&T") and WorldCom Inc.  
23 ("WorldCom") (collectively, "AT&T/WorldCom"), dated July 31, 2001. Mr. Pitkin's

1 testimony describes the modifications AT&T/WorldCom made to the Synthesis Model  
2 assembled by the Commission Staff for federal universal service funding purposes. Mr.  
3 Pitkin contends that, with his modifications, the Synthesis Model can be used to produce  
4 accurate cost estimates for UNEs. I will refer to Mr. Pitkin's version of the Synthesis  
5 Model as the "Modified Synthesis Model" or the "Model."

6  
7 I also will respond to the Direct Testimony of Terry L. Murray on behalf of  
8 AT&T/WorldCom, in which she endorses Mr. Pitkin's testimony and supports the use of  
9 the Modified Synthesis Model.

10  
11 I will address from an economic perspective why the Synthesis Model should not  
12 serve as a foundation for a UNE model. I will explain why the changes made by Mr.  
13 Pitkin render the Modified Synthesis Model even less capable of providing accurate,  
14 company-specific UNE cost estimates in Virginia, or any other state. Consequently, Ms.  
15 Murray's testimony on the supposed merits of the Modified Synthesis Model does not  
16 reflect either sound economics or common sense.

17  
18 **Q. Please summarize your testimony.**

19 **A.** The Synthesis Model was not developed for the purposes proposed by AT&T/WorldCom  
20 -- to measure the forward-looking costs that Verizon Virginia Inc. ("Verizon VA") or, for  
21 that matter, any efficient carrier, would incur in providing UNEs in Virginia. Rather, the  
22 Synthesis Model was designed solely to support the federal universal service program  
23 and determine relative cost differences among states for the purpose of distributing  
24 national high-cost funds. The Commission did not develop, nor intend for, the Synthesis

1 Model to estimate state-specific or company-specific forward-looking UNE costs. In  
2 fact, the Commission strongly suggested that the nationwide default input values  
3 contained in the Synthesis Model were not appropriate for developing UNE costs.  
4 AT&T/WorldCom, however, ignores the Commission's warnings, choosing instead to  
5 forge ahead with a model that is unsuitable for the use to which it is being put. Mr.  
6 Pitkin's extensive modifications do not transform the model into a proper UNE costing  
7 tool; in fact, they make things worse.

8  
9 As modified by AT&T/WorldCom, the Synthesis Model is not a viable or  
10 accurate costing tool for pricing UNEs in Virginia. The theoretical assumptions in the  
11 Modified Synthesis Model, including the engineering deficiencies discussed by Mr.  
12 Murphy, as well as the Model's estimating algorithms, are fundamentally flawed and  
13 consistently produce patently unrealistic, unreliable and understated outputs, even when  
14 appropriate cost input values are used. Paramount among these theoretical defects is the  
15 fact that the Modified Synthesis Model does not properly measure the economic costs of  
16 a carrier operating efficiently in Virginia and, therefore, cannot be total element long run  
17 incremental cost ("TELRIC") compliant. The Modified Synthesis Model, by design,  
18 cannot estimate the total costs that a carrier can expect to incur, even under forward-  
19 looking conditions.

20  
21 AT&T/WorldCom's attempt to "customize" the Model cannot change the fact that  
22 the underlying model was not designed to produce reliable UNE costs. In fact, rather  
23 than correcting or enhancing the underlying model, AT&T/WorldCom's modifications

1 incorporate wholly unrealistic inputs and calculations that actually exacerbate the  
2 underlying model's tendency to understate the costs of individual UNEs. For example,  
3 instead of using the Synthesis Model's 1998 actual line counts, the Modified Synthesis  
4 Model relies on an estimated line count for 2002, which assumes an increase of 2.6  
5 million lines at existing customer locations -- 63 percent more than Verizon VA's 1998  
6 line count. Despite the profound impact of these changes on cost calculations,  
7 AT&T/WorldCom has never bothered to verify the Model's cost estimates against the  
8 real-world operations of actual carriers. The minimum test of any modeling effort is  
9 whether it produces reasonable results that are consistent with common sense and with  
10 the experiences of experts familiar with the problem being modeled. As described in  
11 more detail below and in the testimony of Mr. Murphy, the Modified Synthesis Model  
12 fails this basic test of reasonableness.

13  
14 Predictably, AT&T/WorldCom's incorporation of unreasonable inputs and  
15 assumptions into the Modified Synthesis Model produces cost estimates that are far  
16 below any reasonable indicator of cost. When compared to other models and the current  
17 costs incurred by Verizon VA and other competitive carriers, the magnitude of the cost  
18 understatements clearly indicates that the Model produces meaningless and  
19 unsubstantiated outputs that are completely divorced from reality:

- 20 • The Modified Synthesis Model estimates a statewide average loop cost for  
21 Virginia of \$5.92. This is less than one-third of the estimate produced by  
22 Synthesis Model, and is 56 percent less than the cost estimate filed by  
23 AT&T/WorldCom in Virginia just four years ago. This result completely

## Rebuttal Testimony of Timothy J. Tardiff

1 contradicts WorldCom's own testimony in its Supreme Court brief on July 23,  
2 2001 that "[a]lthough the computer-based elements of the network (such as the  
3 switches) may be characterized by declining costs, other elements (such as loop  
4 plant) are not declining; for many elements, costs are rising."<sup>1/</sup>  
5

- 6 • The Modified Synthesis Model estimates that a brand new network can be  
7 deployed throughout Virginia with the minimal investment of approximately \$455  
8 per-line, an estimate that is a fraction of the \$3,000 per-line investment made by  
9 competitive local exchange carriers ("CLECs") between 1997 and 2000.  
10
- 11 • The Modified Synthesis Model's investment levels are less than one-half of  
12 Verizon VA's total investment. In fact, the Model estimates that the total  
13 investment required to re-build Verizon's entire Virginia network (and grow it by  
14 30 percent) is only \$3 billion. This is only \$700 million more than Verizon VA  
15 spent on upgrades and expansions in four years (year-end 1996 to year-end 2000).  
16
- 17 • The Modified Synthesis Model also produces expenses that are one-third of  
18 Verizon VA's current levels. For example, the Model's estimates only account  
19 for 12 percent of Verizon VA's land and support asset expenses, 32 percent of  
20 Verizon VA's cable and wire expenses, 54 percent of Verizon VA's digital  
21 switching expenses, and 76 percent of Verizon VA's circuit equipment expenses.  
22

23 These results highlight the wide discrepancy between the Modified Synthesis  
24 Model and real-world results, and make clear that the Model is not capable of producing  
25 accurate cost estimates.  
26

27 In sum, AT&T/WorldCom has abandoned the HAI Model -- a UNE Cost Model it  
28 commissioned and continues to sponsor in other state proceedings -- in favor of the  
29 Synthesis Model -- a USF cost model that was never intended to produce reliable UNE  
30 cost estimates. AT&T/WorldCom has modified the Synthesis Model by picking and  
31 choosing those changes that work to its advantage, thereby ensuring that the Synthesis

---

<sup>1/</sup> *WorldCom, Inc. v. Verizon Communications, Inc.*, No. 00-555 (July 23, 2001) at p. 6 (emphasis added).

1 Model produces unrealistically low UNE cost estimates that benefit AT&T/WorldCom,  
2 but will inhibit the development of economically efficient competition in Virginia.

3  
4 **II. NEITHER THE SYNTHESIS MODEL, NOR THE MODIFIED**  
5 **SYNTHESIS MODEL, IS A VIABLE TOOL FOR ESTIMATING**  
6 **FORWARD-LOOKING UNE COSTS**  
7 **(JDPL ISSUES II-1 TO II-1-C; II-2 TO II-2-C)**

8 **Q. Why shouldn't the Synthesis Model be used to estimate Verizon VA's forward-**  
9 **looking costs of providing UNEs?**

10 A. First, as Mr. Pitkin admits, the Synthesis Model was not designed to measure company-  
11 specific UNE costs. As the Commission and its Staff have repeatedly stressed, the  
12 Synthesis Model was created to determine the relative cost differences among states for  
13 the sole purpose of distributing national high-cost support; the Model was not designed to  
14 estimate state or company-specific forward-looking costs of providing UNEs<sup>2/</sup> -- a  
15 necessary prerequisite to the determination of proper and accurate UNE estimates. The  
16 Commission itself has repeatedly rejected arguments that the Synthesis Model should be  
17 used to determine the level of UNE prices.<sup>3/</sup> Second, as many parties have demonstrated

---

<sup>2/</sup> In the Matter of Federal-State Joint Board on Universal Service; In the Matter of Forward-Looking Mechanism for High Cost Support for Non-Rural LECs, CC Docket Nos. 96-45 and 97-160, *Fifth Report and Order*, FCC 98-279 (rel. Oct. 28, 1998) ("Fifth Report and Order") at ¶ 12; In the Matter of Federal-State Joint Board on Universal Service; In the Matter of Forward-Looking Mechanism for High Cost Support for Non-Rural LECs, CC Docket Nos. 96-45 and 97-160, *Tenth Report and Order*, FCC 99-304 (rel. Nov. 2, 1999) at ¶ 41 ("Tenth Report and Order").

<sup>3/</sup> See e.g., In the Matter of Application by Bell Atlantic New York for Authorization Under Section 271 of the Communications Act to Provide In-Region, InterLATA Service in the State of New York, CC Docket No. 99-295, *Memorandum Opinion and Order*, FCC 99-404 (rel. Dec. 22, 1999) at ¶ 245; In the Matter of Application of Verizon New England Inc., Bell Atlantic Communications, Inc. (d/b/a Verizon Long Distance), NYNEX Long Distance Company (d/b/a Verizon Enterprise Solutions) and Verizon Global Networks, Inc.) for Authorization to Provide In-Region, InterLATA Services in Massachusetts, CC Docket No. 01-9, *Memorandum Opinion and Order*, FCC 01-30 (rel. April 16, 2001) at ¶ 31.

1 over the last two years, the conceptual underpinnings of the Synthesis Model render it an  
2 inappropriate starting point for the development of an accurate state- and company-  
3 specific UNE model. Specifically, because the Synthesis Model attempts to size and  
4 configure an unchanging, hypothetical network to satisfy a known and fixed level of  
5 demand, it cannot acknowledge the dynamic process by which telecommunications  
6 companies actually deploy network resources to provide telecommunications services to  
7 meet constantly-changing demand. Because the Synthesis Model does not estimate the  
8 true forward-looking costs likely to be incurred by Verizon VA in providing basic local  
9 exchange service, it should not be used to set Verizon VA's UNE rates.

10  
11 **Q. Did the Commission contemplate using the Synthesis Model to determine the costs**  
12 **of providing universal service and UNEs?**

13 A. No, it did not. Mr. Pitkin and Ms. Murray rely upon a 1997 Commission Order in which  
14 the Commission discussed the use of the same methodology for determining universal  
15 service support and UNE costs.<sup>4/</sup> This discussion, however, is dated and focuses on the  
16 methodology used, as opposed to a specific model. Although the Commission  
17 encouraged the use of UNE prices as a basis for USF studies, the Commission was  
18 actually describing the requirements for models that a state might utilize to determine  
19 state-specific costing requirements, not the national model that it subsequently adopted

---

<sup>4/</sup> Before the Federal Communications Commission, CC Docket Nos. 00-218, -249, -251, *Direct Testimony of Brian F. Pitkin* (July 31, 2001) at p. 3 ("Pitkin Direct Testimony"); Before the Federal Communications Commission, CC Docket Nos. 00-218, -249, -251, *Direct Testimony of Terry L. Murray* (July 31, 2001) at p. 10 ("Murray Direct Testimony").



1 for USF purposes. As I discuss in more detail below, the Commission made several  
2 explicit choices in the platform and default inputs of the Synthesis Model that clearly  
3 isolate the Synthesis Model as a universal service costing model, as opposed to a UNE  
4 model.

5  
6 Furthermore, in order to reduce duplication and avoid arbitrage, the Commission  
7 encouraged states to develop UNE prices as a basis for USF purposes -- not the other way  
8 around as Mr. Pitkin claims.<sup>5/</sup> Because a model with sufficient detail to calculate UNE  
9 costs can provide reliable universal service cost results, starting with a UNE model is  
10 eminently sensible. On the other hand, because, by design, the Synthesis Model  
11 sacrificed the specificity needed to produce the full range of UNE costs and was  
12 developed for the sole purpose of "estimating the investments and costs of the elements  
13 required to provide basic telecommunications services,"<sup>6/</sup> it cannot achieve this dual  
14 purpose by incorporating the simplistic modifications proposed by Mr. Pitkin. Mr.  
15 Pitkin's suggestion that the Commission implicitly contemplated the use of its model for  
16 UNE purposes is absurd and directly contradicts what the full Commission has held  
17 repeatedly.

---

<sup>5/</sup> Pitkin Direct Testimony at p. 3.

<sup>6/</sup> Pitkin Direct Testimony at p. 2.

1   **Q.    Does the fact that the Commission designed the Synthesis Model to produce average**  
2       **loop costs for each wire center have implications for using it to calculate UNE loop**  
3       **costs?**

4   **A.    Yes. The Model appears to estimate the specific feeder facilities that it assumes each**  
5       **distribution area would use (e.g., the amount of fiber feeder investment for an areas**  
6       **served by fiber and the amount of copper investment for areas with copper feeder), and**  
7       **then produces a total investment for the entire wire center. That total investment is re-**  
8       **allocated to each distribution area in proportion to the number of lines and the distance**  
9       **from the wire center. In the process, the Model has assigned copper facilities to areas**  
10      **served by fiber feeder and vice versa. Therefore, assuming, hypothetically, that the**  
11      **Model's initial determination of loop facilities was correct, it then assigns some of the**  
12      **resulting costs to loops that did not cause them.**

13  
14   **Q.    Are inaccuracies introduced by this allocation?**

15   **A.    Not in the case of the Commission's use of the Model for USF. The wire center average**  
16      **cost is unaffected by the allocation of total costs to individual distribution areas because**  
17      **the Commission was only interested in the average loop cost for a wire center, and all**  
18      **costs associated with loops in the wire center are included (and costs associated with**  
19      **other loops are excluded). However, the situation is different when the Model is used to**  
20      **disaggregate loop costs by density zone and type of feeder (DLC versus non-DCL). For**  
21      **the feeder type disaggregation, because costs have clearly been misassigned, the**  
22      **disaggregated averages are essentially meaningless. The average (over DLC and non-**  
23      **DLC) loop costs within a density class are also suspect, because their validity depends on**

1 the unlikely assumption that overall average feeder investment per line-foot is uniform  
2 throughout the wire center.

3  
4 **Q. Are the modifications proposed by Mr. Pitkin sufficient to transform the**  
5 **Commission's universal service model into an accurate UNE model?**

6 **A.** No. The modifications proposed by Mr. Pitkin are not sufficient to transform this generic  
7 universal service cost model into a state-and company-specific model that is capable of  
8 accurately estimating Verizon VA's or any efficient carrier's forward-looking cost of  
9 providing UNEs. For instance, the Modified Synthesis Model sponsors fail to address the  
10 following problems:

11  
12 1) Inappropriate Methodology. The Modified Synthesis Model does not comply with  
13 forward-looking economic cost principles, including the TELRIC methodology. It  
14 models a static network and excludes, by design, many of the costs that would be  
15 necessary even for a network built from scratch today in order to respond efficiently  
16 to customer movement (also called "churn"), demand fluctuations, demand growth,  
17 and network modification that must necessarily be incurred to operate a network. The  
18 excluded costs are, in every practical sense, the real forward-looking costs of serving  
19 an existing level of demand -- no provider can offer reliable, timely service to its  
20 customers without maintaining a network that is flexible enough to accommodate the  
21 inevitable churn, demand fluctuations and demand growth. Mr. Pitkin's failure to  
22 address these shortcomings introduces fatal flaws into a UNE model, for which the  
23 goal is to obtain state-and company-specific cost estimates. Moreover, the Modified

1 Synthesis Model completely ignores the costs associated with emerging competition  
2 on network utilization, capital costs, depreciation, and other factors.  
3

4 2) Calculation Errors. As Verizon VA and other parties have noted, the Synthesis  
5 Model makes calculation mistakes, and incorporates a number of unrealistic and  
6 invalid input assumptions.  
7

8 3) Unsubstantiated Outputs and Undocumented Data and Algorithms. The estimates of  
9 the Synthesis Model, as well as the Modified Synthesis Model, have never been  
10 validated against any real-world data. Moreover, Mr. Pitkin has failed to document  
11 the Modified Synthesis Model in a manner that explains and allows others to  
12 efficiently validate its underlying algorithms, evaluate whether its default inputs are  
13 appropriate for Virginia, or verify that the Modified Synthesis Model's outputs are  
14 accurate and an appropriate measure of Verizon VA's or any efficient carrier's  
15 forward-looking costs. In fact, the Modified Synthesis Model sponsors assume away  
16 any verification requirements, effectively rejecting the real operations of an  
17 incumbent local exchange carrier ("ILEC") when these verification requirements fail  
18 to conform to the predictions of the Model.  
19

20 For these and other reasons, the Modified Synthesis Model cannot properly be  
21 used to set rates for Verizon VA's UNE offerings.

1 **Q. Does the Modified Synthesis Model create an efficient network?**

2 A. Absolutely not. Artificially low costs are not efficient costs. Mr. Pitkin seems to suggest  
3 that any model that produces forward-looking costs exceeding the estimates produced by  
4 the Modified Synthesis Model would "reward an incumbent carrier for inefficiencies that  
5 may exist in its embedded network."<sup>7/</sup> Interestingly, Mr. Pitkin has not identified any  
6 inefficiencies in incumbent carriers networks and offers no evidence as to why the  
7 estimates of the model he endorses are more accurate than those produced by actual  
8 telecommunications carriers with decades of experience in building and maintaining a  
9 functioning local network. Further, as shown below, even the Synthesis Model and the  
10 HAI Model commissioned by AT&T/WorldCom, which AT&T/WorldCom continues to  
11 sponsor in various states, produce much higher UNE estimates for Verizon VA.

12  
13 **III. THEORETICAL DEFECTS: THE MODIFIED SYNTHESIS MODEL IS**  
14 **NOT TELRIC-COMPLIANT**  
15 **(JDPL ISSUES II-1 TO II-1-C; II-2 TO II-2-C)**

16 **Q. Does the Modified Synthesis Model generate cost estimates that are consistent with**  
17 **TELRIC principles?**

18 A. No. The Modified Synthesis Model does not estimate TELRIC costs because it is  
19 incapable of estimating the total costs that Verizon VA, or any efficient carrier, can  
20 expect to incur, even under forward-looking conditions.<sup>8/</sup> The Modified Synthesis Model

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<sup>7/</sup> Pitkin Direct Testimony at p. 5.

<sup>8/</sup> Robert Atkinson, Executive Director of Columbia University's Institute for Tele-Information and formerly Deputy Chief of the Commission's Common Carrier Bureau, recently described the harm wreaked by uneconomically low UNE prices: "Putting too low a price on unbundled network elements saps the value of companies that have spent money to install their own lines." Act Said to Slow Competition, *Telco Business Report* (July 16, 2001). In addition, understated prices for unbundled network elements fail to compensate the incumbent

1 specifically excludes, by design, many of the costs of a dynamic forward-looking  
2 network. One of the primary reasons the Modified Synthesis Model produces  
3 unattainably low cost estimates is its purely hypothetical assumption that a brand new,  
4 "fully functioning" network is built instantaneously and dropped into place at a single  
5 point in time -- a network that will never experience any growth, churn, or fluctuations in  
6 demand. This "instant network in a box" is not how a real network is constructed, nor is  
7 it how a network should be constructed. A network that does not have sufficient "play in  
8 the joints" to allow for churn, irregularly distributed demand, fluctuations in demand, and  
9 overall growth in demand, and is not designed to address real world considerations,  
10 cannot serve a carrier's customers without an unacceptable risk of service disruption or  
11 unsatisfied customer requests. A network cannot be said to "serve" existing demand if it  
12 cannot efficiently accommodate predictable changes and rearrangements in that demand.  
13 The Modified Synthesis Model fails on both counts, and thus does not comply with  
14 TELRIC principles.

15  
16 **Q. How are real-world considerations reflected in the operation of an efficient**  
17 **network?**

18 **A.** As Mr. Murphy's testimony explains, engineering guidelines for local exchanges are  
19 designed to cope with the fact that: (1) demand changes over time, it increases in some

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for its economic costs and place it at a competitive disadvantage with respect to firms using such underpriced UNEs. Understated prices can also harm economic efficiency more generally by encouraging inefficient entry by competing firms. Firms entering under such a regime could have a disincentive to introduce or improve their own systems to the extent they can obtain elements at uneconomically low prices from the incumbent.

1 places and for some services and declines for others; and (2) demand is uncertain, both as  
2 to place and time (it cannot be determined in advance which services customers will  
3 order, when they will order these services, which customers will move, or when they will  
4 move). In addition, changing technology and market conditions require periodic  
5 upgrades to software and hardware. In this environment, it is not efficient for a  
6 telecommunications firm to install only the equipment it will need at a single point in  
7 time. Rather, efficient practices call for the installation of plant with enough capacity to  
8 meet short-run demand growth (e.g., two to three years for new switches) and to  
9 implement growth jobs and upgrades over the life of the plant. Moreover, practical, real-  
10 world considerations call for network-engineering practices that account for  
11 administrative spare capacity, churn, demand fluctuations, and assure compliance with  
12 service quality standards. To minimize costs, efficient firms continually adjust their  
13 factors of production to augment and replace facilities. The long-run costs of each and  
14 every real-world network reflect this fundamentally dynamic optimization process.

15  
16 **Q. From a "long run" perspective, is it possible to predict demand accurately and**  
17 **design a static network to accommodate that predicted level of demand?**

18 **A.** No. Economists recognize that the textbook case -- in which the long-run is a period long  
19 enough to allow a firm to reach its optimum scale of operation -- is a hypothetical,  
20 limiting case, and is not how real-world telecommunications firms generally operate.  
21 Even new entrants are constrained by current and future conditions, including the  
22 inherent uncertainty in the location and amount of customer demand over time. Further,  
23 no firm has perfect knowledge of current and future technologies, and thus cannot

1 determine, far in advance of making any investment decisions and with perfect certainty,  
2 what its global cost-minimizing cost structure might be. As a result, a real-world firm  
3 necessarily makes investment decisions without perfect knowledge of the future of  
4 technology or demand, but with the expectation that demand will grow and shift and that  
5 facilities will be relieved and replaced. These uncertainties of demand in the real world  
6 cannot be eliminated, no matter how "forward-looking" or "long-run" the approach.<sup>2/</sup> The  
7 Modified Synthesis Model, with its static view of a telecommunications network and  
8 customer demand, and its idealized version of what is required to provide service,  
9 assumes a level of "efficiency" that is unattainable by any forward-looking network.

10  
11 **Q. In what way does the Modified Synthesis Model fail to capture the true forward-**  
12 **looking costs of an efficient network?**

13 **A.** One of the problems with the Synthesis Model, further exacerbated by  
14 AT&T/WorldCom's modifications, is its omission of a substantial amount of the current  
15 costs needed to accommodate growth and changes in demand. The Synthesis Model and

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<sup>2/</sup> This issue is addressed by the application of "real options" theory to telecommunications costing. Professor William Baumol, a prominent economist and frequent consultant to AT&T, described this theory as follows:

[O]ne can characterize the pertinent part of the new analysis as follows. It tells us that investment decisions typically have a cost component that has usually been overlooked, so that the total costs of such decisions (and, hence, their appropriate price) is normally underestimated. The overlooked cost component is the narrowing of future choices that a current investment commitment entails. By making such a commitment, the decisionmakers forego some of their future options. The decisions preclude choices the decisionmakers may prefer to change as the passage of time increases the information available to them. But such changes are no longer open to them because of their investment commitment.

William J. Baumol, "Option Value Analysis and Telephone Access Charges," in James Alleman and Eli Noam, eds., *The New Investment Theory of Real Options and its Implications for Telecommunications Economics*, Boston: Kluwer, 1999.



1 the Modified Synthesis Model implicitly assume that an ILEC instantly sizes its plant to  
2 perfectly accommodate current demand, utilizing ideally-sized facilities obtained at  
3 maximum volume discounts.

4  
5 This assumption is counterfactual: real firms must grow to meet demand as it  
6 materializes over time (growth) and must be structured to respond to shifts in demand at  
7 particular locations (due to churn, fluctuations, and growth) without having to augment or  
8 replace facilities constantly. Firms in the real world, including incumbents and new  
9 entrants alike, add capacity over time, taking into account the trade-off between the lower  
10 per-unit costs of bigger modules (e.g., larger switches, larger cable sizes), the costs  
11 incurred to install additional capacity (a particularly significant factor for outside plant  
12 ("OSP") facilities), as well as the costs of carrying unused capacity. The Modified  
13 Synthesis Model completely ignores these and other real-world trade-offs.

14  
15 **Q. Have AT&T/WorldCom's witnesses acknowledged the unrealistic nature of the**  
16 **assumptions underlying the Modified Synthesis Model?**

17 **A.** Yes, AT&T witnesses familiar with proxy models and how networks are actually  
18 engineered admit that the Modified Synthesis Model's fundamental assumptions do not  
19 reflect reality. For example, while the Modified Synthesis Model's "scorched node"  
20 assumption implies not only that the Model is based on the use of existing wire center  
21 locations, but also that all plant is built instantaneously at these locations,  
22 AT&T/WorldCom witness Mr. Joseph Riolo has testified that "[i]t would be highly  
23 unusual that in a real world situation that you would construct a total network on day

1 one."<sup>10/</sup> Mr. Riolo recently acknowledged the Modified Synthesis Model's shortcomings  
2 when stating that the Model "is not modeling a network as I would traditionally build it  
3 as an ILEC."<sup>11/</sup> Similarly, AT&T witness Dr. Mercer -- prime architect of the switching  
4 and interoffice facilities components of the Modified Synthesis Model -- agreed that, in  
5 the real world, switching capacity is added over time to accommodate growing demand.<sup>12/</sup>  
6 The Modified Synthesis Model simply does not estimate the true costs of a functioning,  
7 constantly-evolving network.  
8

9 **Q. What types of costs are excluded under the Modified Synthesis Model's**  
10 **"instantaneous, all-new, perfectly-sized" modeling approach?**

11 **A.** There are many costs omitted from the Modified Synthesis Model's approach. For  
12 example, the extremely high utilization factors used in the Modified Synthesis Model  
13 imply that the spare capacity needed to accommodate administrative requirements, churn,  
14 demand fluctuations, and demand growth is not a current, forward-looking cost. This  
15 makes no sense.

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<sup>10/</sup> Before the California Public Utilities Commission, Docket Nos. I. 93-04-002, R.93-04-003, *Deposition Testimony of Mr. Joseph Riolo, Dr. Robert Mercer, and Ms. Terry Murray* (Mar. 7, 1997) at p. 12 ("California Deposition").

<sup>11/</sup> Before the Maryland Public Service Commission, Case No. 8745, *Hearing Testimony of Mr. Joseph P. Riolo* (June 28, 2001) at p. 1003.

<sup>12/</sup> California Deposition at p. 442.

1           An efficient telecommunications firm must maintain adequate spare capacity as a  
2           current cost. If it fails to do so, the cost of accommodating changes in demand will be  
3           higher. (For example, it would cost far more to dig up a street twice to add one additional  
4           unit of OSP capacity, than it would to dig up the street once to add two units). The  
5           omission of the costs of spare capacity would necessarily have a direct impact on the cost  
6           and time required to provide new service, the ability to complete repairs, and the ability  
7           to provide the quality of service required by the Virginia State Corporation Commission  
8           and expected by Virginia consumers. The spare capacity required for the efficient  
9           operation of a network that is able to accommodate uncertainty in demand and growth is  
10          a permanent, forward-looking cost of doing business for which the artificial assumptions  
11          of the Modified Synthesis Model fail to account.

12  
13   **Q.    Are the costs of growth and churn reflected in the utilization factors of the Modified**  
14   **Synthesis Model?**

15   **A.**   Not appropriately or sufficiently. As Mr. Murphy describes, the Modified Synthesis  
16   Model's utilization factors do not fully account for growth and churn in a dynamic  
17   network and the utilization factors assumed by the Modified Synthesis Model for  
18   distribution cable do not reflect properly sized distribution plant.

19  
20           Moreover, the Modified Synthesis Model's utilization factors do not take into  
21   account the impact competition has on an efficient competitor in the local exchange  
22   market. Mr. Pitkin seems to suggest that competitive firms should have minimal spare  
23   capacity, when, in fact, the opposite is true. In a competitive environment, Verizon VA  
24   must have sufficient spare capacity to respond to the increased volatility of customer

1 demand, as well as the increased demands of CLECs desiring to use its network. Further,  
2 as long as Verizon VA continues to serve as a carrier of last resort in an increasingly  
3 competitive environment, it will have to stand ready to provide facilities while facing an  
4 increasing risk that the expected demand will not materialize.

5  
6 **Q. Can the omission of costs associated with a dynamic network functioning in a**  
7 **competitive environment be corrected by revising the Modified Synthesis Model's**  
8 **inputs?**

9 **A.** No. As discussed in Mr. Murphy's testimony, the Model's algorithms are based on  
10 erroneous engineering assumptions. Paramount among these are flawed assumptions that  
11 produce overly large distribution areas and build distribution plant that does not account  
12 for factors such as administrative spare, churn, demand fluctuations, and demand growth.  
13 Because the very structure of the Model reflects faulty assumptions about real-world  
14 networks, the Model's outputs cannot be corrected after the fact by simply tinkering with  
15 the input values.

16  
17 For example, the Model's algorithm for producing distribution areas attempts to  
18 produce an "optimal" loop plant that completely ignores the dynamic process of growing  
19 a network found in the real-world. The Model produces distribution areas using a single  
20 set of customer locations that do not vary with the line count number. This produces  
21 different distribution areas (clusters) for different line counts. Building the network to  
22 accommodate the Commission's 1998 line count of 4.1 million produces about 3,900  
23 distribution areas, whereas when Mr. Pitkin's estimated 2002 line count of 6.7 million is  
24 used, the Model produces 5,600 distribution areas. Thus, according to the Model, a

1 carrier that had "optimally efficient" distribution areas at the earlier lower line count  
2 would be deemed to have an "inefficient" design when it expanded its existing network to  
3 accommodate growth. Rather than "growing" the network, the Model completely  
4 rebuilds it with different distribution areas. In the real world, firms do not have the  
5 luxury of completely reconfiguring features of the network, such as distribution areas,  
6 when they accommodate growth and demand changes. The Model employs an algorithm  
7 that systematically ignores this reality, and simply tinkering with input values cannot  
8 resolve this structural defect in the Model. A flawed algorithm produces flawed results.  
9 The Model cannot estimate the forward-looking costs of even a hypothetical efficient  
10 carrier -- much less any efficient carrier operating in the real world in Virginia. As a  
11 result, the Model is not TELRIC-compliant and should not be used to establish Verizon  
12 VA's UNE rates.

13  
14 **IV. THE MODIFIED SYNTHESIS MODEL HAS NOT BEEN VALIDATED;**  
15 **IT IS UNTESTED AND PATENTLY UNRELIABLE**  
16 **(JDPL ISSUES II-1 TO II-1-C; II-2 TO II-2-C)**

17 **Q. Are there other problems with the Modified Synthesis Model beyond its failure to**  
18 **take into account the dynamic aspects of building and maintaining a network?**

19 **A.** Yes. Any abstract model using untested estimation methodologies should have its  
20 outputs validated against real-world results before it is adopted to set mandatory rates.  
21 Yet, the Modified Synthesis Model has never been validated, and its complex structure  
22 makes it difficult to verify whether the Model functions as described by its sponsors.  
23 This problem is compounded by the fact that the Modified Synthesis Model is essentially  
24 a new model and, as such, has never been thoroughly analyzed or tested.